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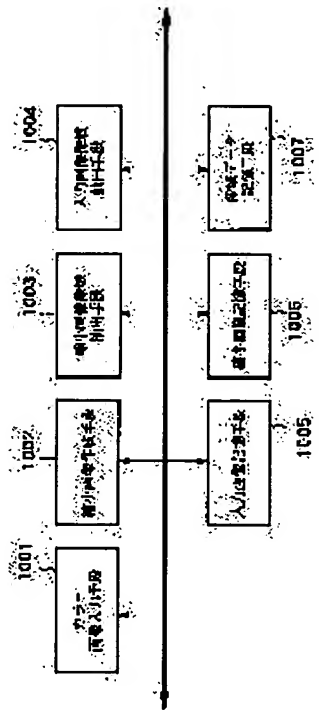
(54) METHOD AND DEVICE FOR PROCESSING IMAGE

(57)Abstract:

PURPOSE: To perform improved image area separation of color document images at a high speed regardless of the size of input images by using the data of the image area extracted in a reduction image image area extraction process and extracting the image area in the input images.

CONSTITUTION: A reduction image preparation means 1002 prepares reduction images from input color images stored in an input image storage means 1005 by a color image input means 1001 and stores them in a reduction image storage means 1006. A reduction image image area extraction means 1003 extracts the image area from the reduction images prepared by the reduction image preparation means 1002 and stored in the reduction image storage means 1006 and stores the data of the image area in an image area data storage means 1007. An input image image area extraction means 1004 extracts the image area in the input images from the image area data of the reduction images extracted by the reduction image image area extraction means 1003 and stored in the image area data storage means 1007 and stores it in the image area data storage means 1007. Thus, the image area separation of the color document images equivalent to the result of performing direct image area separation to the input images is made possible.



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CLAIMS

[Claim(s)]
[Claim 1] The image-processing approach of carrying out having the contraction image creation process which is the image-processing approach of extracting each image area, and creates a contraction image from an input image, the contraction image image-area extract process of extracting the image area in a contraction image, and the input image image-area extract process of extracting the image area in an input image using the data of the image area which extracted at a contraction image image-area extract process, to the color document image with which an image area with a different component is intermingled as the description.
[Claim 2] Said contraction image image-area extract process is the image-processing approach given in the 1st term of a claim which applies recursively the background image-area separation process of separating the background image area concerned, and two processes of the middle image-area separation process of dividing image areas other than a background image area into two or more middle image areas to the image area separated at the middle image area separation process, and extracts an image area while judging whether the image area used as a background is located in the object image area in an image.
[Claim 3] The image area location conversion process which computes the positional information of the image area which extracted said input image image area extract process at the contraction image image area extract process, and the positional information of the image area in the input image from the reduction percentage of a contraction image, The image-processing approach given in the 1st term of a claim or the 2nd term characterized by including the input image image area configuration extract process of extracting the image area configuration of an input image, in the rectangle image area of the image area location computed at the image area location conversion process in an input image.
[Claim 4] The image area location conversion process which computes the positional information of the image area which extracted said input image image area extract process at the contraction image image area extract process, and the positional information of the image area in the input image from the reduction percentage of a contraction image, The 1st term of a claim characterized by including the alternative input image image area configuration extract process of extracting the image area configuration in an input image only to the pixel corresponding to the image area extracted at the contraction image image area extract process, or the image-processing approach given in the 2nd term.
[Claim 5] The image area location conversion process which computes the positional information of the image area which extracted said input image image area extract process at the contraction image image area extract process, and the positional information of the image area in the input image from the reduction percentage of a contraction image, The contraction image image area configuration expansion process which swells the image area configuration extracted at the contraction image image area extract process, The image-processing approach given in the 1st term of a claim or the 2nd term characterized by including the alternative input image image area configuration extract process of extracting the image area configuration in an input image only to the pixel corresponding to the image area which expanded at the contraction image image area expansion process.
[Claim 6] The image area location conversion process which computes the positional information of the image area which extracted said input image image area extract process at the contraction image image area extract process, and the positional information of the image area in the input image from reduction percentage, In the rectangle image area of the image area location computed at the image area location conversion process in an input image By comparing the input image image area configuration extract process of extracting the image area configuration of an input image, and the image area extracted from the contraction image with the image area extracted from the input image The image-processing approach given in the 1st term of a claim or the 2nd term characterized by including the chip image area extract process of extracting the image area which lacked in the creation time of a contraction image, and the chip image area integrated process which was extracted at the chip image area extract process, and which is missing and

unifies an image area.
[Claim 7] As opposed to the image area configuration which created said chip image area extract process at the input image image area configuration extract process Are the process which attaches the label for every image area to the pixel corresponding to each image area extracted at the contraction image image area extract process, is missing and extracts the pixel which was not able to carry out label attachment as an image area, and a chip image area integrated process receives the pixel of a chip image area. The image-processing approach given in the 6th term of a claim characterized by attaching the label of the pixel of No. 1 [about] with a label, and unifying a chip image area.
[Claim 8] Said input image image area configuration extract process and this alternative input image image area configuration extract process are the image-processing approach given in either the 3rd term of a claim which makes the pixel of an input image binary in addition to a background and a background, and extracts the image area in an input image thru/or the 7th term using the value of the background color computed at the contraction image image area extract process.
[Claim 9] Said contraction image creation process is the image-processing approach given in either the 3rd term of a claim characterized by dividing an input image into the block which consists of a NxN pixel, choosing 1 pixel from a block, and creating the contraction image of a 1-/Nx1-/N pixel thru/or the 8th term.
[Claim 10] Said contraction image creation process is the image-processing approach given in either the 3rd term of a claim characterized by dividing an input image into the block which consists of a NxN pixel, determining a new pixel value from the average of each pixel within a block, and creating the contraction image of a 1-/Nx1-/N pixel thru/or the 8th term.
[Claim 11] Furthermore, the image-processing approach given in either the 1st term of a claim characterized by having the accommodative variable power process which carries out variable power of the image by carrying out variable power of the data of an image area using the respectively different variable power approach according to the component of the image area obtained at this image area judging process for every image area obtained at the image area judging process of judging the component of each image area, and this image area extract process thru/or the 10th term.
[Claim 12] According to the component of the image area obtained at this image area judging process for every image area obtained at the image area judging process of judging the component of each image area, and this image area extract process, furthermore, by compressing the data of an image area using the respectively different compression approach The image-processing approach given in either the 1st term of a claim characterized by having the accommodative pressing operation which compresses an image, and the color picture playback process which reproduces compressed data for every image area by the playback approach corresponding to the compression approach at the time of compression, and reproduces an image thru/or the 10th term.
[Claim 13] Furthermore, the image-processing approach given in either the 1st term of a claim characterized by having the image area judging process of judging the component of each image area, the data-conversion process which changes into the data format of well-known image edit equipment the image area obtained at this image area extract process, and the image edit process of editing the data of each image area thru/or the 10th term.
[Claim 14] The image processing system carry out having a contraction image creation means is an image processing system and create a contraction image from an input image extract each image area, a contraction image image-area extract means extract the image area in a contraction image, and an input image image-area extract means extract the image area in an input image using the data of the image area which extracted with the contraction image image-area extract means, to the color document image with which an image area with a different component is intermingled as the description.
[Claim 15] Said contraction image image-area extract means is an image processing system given in the 14th term of a claim which applies recursively a background image-area separation means separate this background image area, and two means of a middle image-area separation means divide image areas other than a background image area into two or more middle image areas to the image area separated with the middle image area separation means, and extracts an image area while judging whether the image area used as a background is located in the object image area in an image.
[Claim 16] An image area location conversion means to compute the positional information of the image area which extracted said input image image area extract means with the contraction image image area extract means, and the positional information of the image area in the input image from the reduction percentage of a contraction image, An image processing system given in the 14th term of a claim or the 15th term characterized by including an input image image area configuration extract means to extract the image area configuration of an input image, in the rectangle image area of the image area location computed with the image area location conversion means in an input image.
[Claim 17] An image area location conversion means to compute the positional information of the image area which

extracted said input image image area extract means with the contraction image image area extract means, and the positional information of the image area in the input image from the reduction percentage of a contraction image, An image processing system given in the 14th term of a claim or the 15th term characterized by including an alternative input image image area configuration extract means to extract the image area configuration in an input image only to the pixel corresponding to the image area extracted with the contraction image image area extract means.

[Claim 18] An image area location conversion means to compute the positional information of the image area which extracted said input image image area extract means with the contraction image image area extract means, and the positional information of the image area in the input image from the reduction percentage of a contraction image, The contraction image image area configuration expansion means which swells the image area configuration extracted with the contraction image image area extract means, An image processing system given in the 14th term of a claim or the 15th term characterized by including an alternative input image image area configuration extract means to extract the image area configuration in an input image only to the pixel corresponding to the image area which expanded with the contraction image image area expansion means.

[Claim 19] An image area location conversion means to compute the positional information of the image area which extracted said input image image area extract means with the contraction image image area extract means, and the positional information of the image area in the input image from reduction percentage, In the rectangle image area of the image area location computed with the image area location conversion means in an input image By comparing an input image image area configuration extract means to extract the image area configuration of an input image, and the image area extracted from the contraction image with the image area extracted from the input image An image processing system given in the 14th term of a claim or the 15th term characterized by including a chip image area extract means to extract the image area which lacked in the creation time of a contraction image, and a chip image area integrated means extracted with the chip image area extract means to be missing and to unify an image area.

[Claim 20] As opposed to the image area configuration which created said chip image area extract means with the input image image area configuration extract means Are a means to attach the label for every image area to the pixel corresponding to each image area extracted with the contraction image image area extract means, and for it to be missing and to extract the pixel which was not able to carry out label attachment as an image area, and a chip image area integrated means receives the pixel of a chip image area. An image processing system given in the 19th term of a claim characterized by attaching the label of the pixel of No. 1 [about] with a label, and unifying a chip image area.

[Claim 21] Said input image image area configuration extract means and said alternative input image image area configuration extract means are an image processing system given in either the 16th term of a claim characterized by making the pixel of an input image binary in addition to a background and a background, and extracting the image area in an input image using the value of the background color computed with the contraction image image area extract means thru/or the 20th term.

[Claim 22] Said contraction image creation means is the image-processing approach of storage in either the 16th term of a claim which divides an input image into the block which consists of a NxN pixel, chooses 1 pixel from a block, and creates the contraction image of a 1-/Nx1-/N pixel thru/or the 21st term.

[Claim 23] Said contraction image creation means is an image processing system given in either the 16th term of a claim which divides an input image into the block which consists of a NxN pixel, determines a new pixel value from the average of each pixel within a block, and creates the contraction image of a 1-/Nx1-/N pixel thru/or the 21st term.

[Claim 24] Furthermore, an image processing system given in either the 14th term of a claim characterized by having the accommodative variable power means which carries out variable power of the image by carrying out variable power of the data of an image area using the respectively different variable power approach according to the component of the image area obtained with this image area judging means for every image area obtained with an image area judging means to judge the component of each image area, and this image area extract means thru/or the 23rd term.

[Claim 25] Furthermore, by compressing the data of an image area using an image area judging means to judge the component of each image area, and a, respectively different compression means according to the component of the image area obtained with this image area judging means for every image area obtained with this image area extract means An image processing system given in either the 14th term of a claim characterized by having an accommodative compression means to compress an image, and a color picture playback means to reproduce compressed data for every image area with the playback means corresponding to the compression approach at the time of compression, and to reproduce an image thru/or the 23rd term.

[Claim 26] Furthermore, an image processing system given in either the 14th term of a claim characterized by having an image area judging means to judge the component of each image area, a data-conversion means to change into the

data format of well-known image edit equipment the image area obtained with this image area extract means, and an image edit means to edit the data of each image area thru/or the 23rd term.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the image processing system and approach of distinguishing an image for every classification of a field.
[0002]
[Description of the Prior Art] In recent years, the color picture I/O device has spread also through OA field. In connection with this, the manuscripts (space etc.) of a color are read with input units, such as a scanner, and the treatment of the color document image (color picture to which the amount of [a part for white Kurobe or] limited color part occupies most) is also increasing.
[0003] A document image has the description that the image area (the image area of an alphabetic character and image area of a photograph) where properties differ is intermingled, and even if it uses the processing technique used in other fields, such as most important variable power and amount-of-data reduction, as they are, the image of good image quality is not obtained.
[0004] In view of this point, the applicant for this patent proposed Japanese Patent Application No. No. 329111 [six to] etc. (the following, Proposal A).
[0005] It is a thing about the art (the variable power of a color picture, amount-of-data reduction, structuring of data) which used the image area separation approach and image area separation result for a color document image by this proposal A. The background image area separation process of separating a background image area while judging whether the image area used as a background being located in the object image area in an image, It was a thing equipped with the image area extract process of applying recursively two processes of the middle image area separation process of dividing image areas other than a background image area into two or more image areas to the image area separated at the middle image area separation process, and extracting the image area in an image, and the image area judging process of judging the component (it being hereafter called an image area component) of each image area.
[0006] Moreover, in this proposal A, the technique of performing variable power / amount-of-data reduction / document structuring good was also proposed using the result of this image area separation process and this image area judging process.
[0007] Hereafter, image area separation of the color document image shown by Proposal A is described briefly.
[0008] Generally, it is thought that the image area is divided by the background (substrate) in a document image. That is, an image area can be extracted by separating an input image in the part divided by the background. However, although the color of a background can be considered to be white with a common monochrome manuscript, in the technique proposed here, the color of the background of a color copy is not necessarily white. Moreover, in the case of a color copy, there are also many manuscripts with which the background which has other colors on a certain background lapped.
[0009] From this, image area separation shall be recursively performed for the extract of a background, and the image area division based on a background by Proposal A repeatedly to an image area (it is an input image at first). An example of an image area separation procedure is shown in drawing 17 .
[0010] For example, by drawing 17 , a background 7002 is first extracted from an input image. Next, the image areas 7003 and 7004 which can be divided for a background 7002 are extracted. Although image area separation is ended since a background cannot be extracted further, an image area 7004 extracts a background 7005 further, and, as for an image area 7003, continues image area separation similarly. Thus, image area separation is continued until it becomes impossible to extract a background in all image areas. Thus, it is the component of an image area to the separated image area (the image area of an alphabetic character, the image area of a photograph, etc.). a following and image area

component -- calling -- it judges.
[0011] By this technique, the image area which shows the image area which shows a background except a background image area and a background is called a general image area as shown also in drawing 17 . Moreover, the image area which includes for convenience the image area (image area which has not judged whether a background is included or it does not contain) and two or more image areas in the middle of processing is called a middle image area, and the image area (a background image area is included) which processing of division ended is called a termination image area. An input image also serves as a middle image area.
[0012]
[Problem(s) to be Solved by the Invention] As mentioned above, the technique offered by Proposal A can carry out image area separation of the color picture good. However, generally, while image size is large and the document image required many processing times for image area separation, on the other hand, the high-speed processing which can be performed at the field of the invention of the image area separation approach, without there being DTP (Desk Top Publishing) equipment and filing equipment on condition of user interaction, and being overdue in user interaction was called for. In the case where the technique of a publication is enforced [this point and Japanese Patent Application No. / No. 329111 / six to] by software in a computer, when the input image was large, there was a case where processing took time amount.
[0013]
[Means for Solving the Problem] This invention is made in view of this trouble, and are good and the thing which is going to offer the image-processing approach and equipment which perform image area separation of a color document image at a high speed irrespective of the magnitude of an input image the 1st (the 1-10th terms of a claim).
[0014] Moreover, they are good and the thing which is going to offer the image-processing approach and equipment which perform variable power of a color document image at a high speed irrespective of the magnitude of an input image the 2nd (the 11th and 24th terms).
[0015] Moreover, they are good [irrespective of the magnitude of an input image] to the 3rd, and the thing which is going to offer the image-processing approach and equipment which perform compression/elongation of a color document image (playback) at a high speed (the 12th and 25th terms).
[0016] And they are good [irrespective of the magnitude of an input image] to the 4th, and the thing which is going to offer the image-processing approach and equipment which edit a color document image into a high speed (the 13th and 26th terms).
[0017] In order to attain the above-mentioned purpose, after applying to the image which reduced the input image rather than applying directly the approach indicated in this invention by Japanese Patent Application No. No. 329111 [six to] proposed previously to an input image and extracting an image area, an image area equivalent to having extracted directly on an input image based on the data of the image area extracted by the contraction image is extracted at a high speed. By the contraction image, that the size of the image to process is small etc. can extract an image area at a high speed. Moreover, since what is necessary is just to extract an image area, reusing the parameter which also computed the large input image of image size by the contraction image only to the range of the reduced image area, high-speed processing is possible. From this, it is accelerable in an input image as a whole compared with applying direct processing.
[0018] as the image area separation approach using the contraction image from the former, or a hierarchy image (assembly of two or more contraction images with which reduction percentage differs) -- the interactive analysis support system in document image comprehension, "document image database edit managerial system" Kato, flowering trees and shrubs, Sakai, and Institute of Electronics, Information and Communication Engineers technical research report PRL84- although there were 11, 1984, etc., the binary image was targetted for these approaches.
[0019] Since this invention cannot assume the color of a background by the target color picture (or manuscript used as the input) compared with that (for example, white) which can assume the color of a background beforehand by the binary image (or manuscript used as the input) as explained previously, When creating a contraction image, the required image area was thinned out, and the conventional approaches -- the chip of an image area may arise (by the binary image, it is avoidable by thinning out preferentially the white pixel which is a background etc.) -- were not able to be directly applied to the color document image. Moreover, only the location of the image area for which there were few with which the image area (or circumscription rectangle surrounding an image area) lapped by the binary image (or manuscript used as the input), and the contraction image asked is observed. As opposed to what was necessary having been just to have extracted the image area configuration in an input image (the image area location of an input image being cut off) in a color picture (or manuscript used as the input) There are some with which the image area (or circumscription rectangle surrounding an image area) lapped, in addition to the location of the image area for which the

contraction image asked, the configuration of the image area for which it asked by the contraction image also needed to be taken into consideration, and the image area configuration in an input image needed to be extracted.

[0020] From the above thing, in order that this invention might attain the above-mentioned purpose, the 1-10th and the 14-23rd invention concerning this application were equipped with the following configurations. Namely, the contraction image creation process which is the image-processing approach (or equipment) of extracting each image area to the color document image with which an image area with a different component is intermingled, and creates a contraction image from an input image (or means), It is characterized by having the contraction image image area extract process (or means) of extracting the image area in a contraction image, and the input image image area extract process (or means) of extracting the image area in an input image using the data of the image area extracted at the contraction image image area extract process (or means).

[0021] As opposed to the color document image with which an image area with the component from which the 11th and 24th invention concerning this application differs is intermingled The contraction image creation process which is the image-processing approach (or equipment) of extracting each image area, and creates a contraction image from an input image (or means), The contraction image image area extract process of extracting the image area in a contraction image (or means), The input image image area extract process of extracting the image area in an input image using the data of the image area extracted at the contraction image image area extract process (or means) (or means), According to the component of the image area obtained at this image area judging process (or means) for every image area obtained at the image area judging process of judging the component of each image area, and this image area extract process, by carrying out variable power of the data of an image area using the respectively different variable power approach It is characterized by having the accommodative variable power process (or means) which carries out variable power of the image.

[0022] As opposed to the color document image with which an image area with the component from which the 12th and 25th invention concerning this application differs is intermingled The contraction image creation process which is the image-processing approach (or equipment) of extracting each image area, and creates a contraction image from an input image (or means), The contraction image image area extract process of extracting the image area in a contraction image (or means), The input image image area extract process of extracting the image area in an input image using the data of the image area extracted at the contraction image image area extract process (or means) (or means), For every image area obtained at the image area judging process (or means) of judging the component of each image area, and this image area extract process By compressing the data of an image area using the respectively different compression approach according to the component of the image area obtained at this image area judging process (or means) It is characterized by having the accommodative pressing operation (or means) which compresses an image, and the color picture playback process (or means) which reproduces compressed data for every image area by the playback approach corresponding to the compression approach at the time of compression, and reproduces an image.

[0023] As opposed to the color document image with which an image area with the component from which the 13th and 26th invention concerning this application differs is intermingled The contraction image creation process which is the image-processing approach (or equipment) of extracting each image area, and creates a contraction image from an input image (or means), The contraction image image area extract process of extracting the image area in a contraction image (or means), The input image image area extract process of extracting the image area in an input image using the data of the image area extracted at the contraction image image area extract process (or means) (or means), The image area judging process (or means) of judging the component of each image area, and the data-conversion process which changes into the data format of well-known image edit equipment the image area obtained at this image area extract process (or means) (or means), It is characterized by having the image edit process (or means) of editing the data of each image area.

[0024] In the image-processing approach and equipment which perform various processings (the variable power of a color picture, amount-of-data reduction, structuring of data, etc.) by the above configuration by the approach for which this invention divided into each image area the color picture in which the image area where properties differ is intermingled, and it was suitable to each image area, image area separation of the color picture is carried out at a high speed.

[0025] This invention can be used for the device treating the document image of a color. For example, it can use for variable power processings (pixel consistency conversion, variable power output, etc.) (pixel consistency conversion, variable power output, etc.) of the color picture in devices, such as color printer DTP (Desk Top Publishing) equipment (pixel consistency conversion at the time of outputs, such as expansion and contraction), and color facsimile. Moreover, it can use for the amount-of-data reduction at the times of are recording of the color picture to stores (filing equipment etc.), such as the time of the communication link of the image using devices, such as color facsimile and networks

(LAN etc.), and a magnetic disk. Moreover, it can use for DS-ization at the time of the input of the space manuscript in DTP (Desk Top Publishing) equipment etc.
[0026] About other descriptions or configurations of the invention in this application, it will become clear from the following explanation.
[0027]
[Example] Hereafter, the example which starts this invention according to an accompanying drawing is explained to a detail.
[0028] <Explanation of 1st example> drawing 1 shows the procedure in the image processing system of an example. In illustration, the color picture input process 1 acquires the digital color picture which processes. The contraction image creation process 2 creates a contraction image from the inputted color picture. The contraction image image area extract process 3 extracts an image area from the contraction image created according to the contraction image creation process 2. The input image image area extract process 4 extracts an image area from an input image based on the data of the image area extracted from the contraction image according to the contraction image image area extract process 3.

[0029] Drawing 2 is a drawing showing the example of a configuration of the color picture processor which processes drawing 1 . Moreover, drawing 3 is an example of hardware which realizes the configuration shown in drawing 2 . In drawing 3 , as for CPU and 2002, 2001 is [a disk unit, the bus to which in disk I/O and 2004 an I/O Port and 2006 connect RAM (random access memory) to, and, as for 2007, ROM (read-only memory) and 2005 connect / 2003 / the above-mentioned block, and 2008] color picture input units, and 2009 is a color picture output unit.
[0030] In drawing 2 , the color picture input means 1001 gains the digital color picture which processes, and stores it in the input image storage means 1005. For example, in drawing 3 , by control of CPU2001 which operates by the program on ROM2004 or RAM2006, a color picture is inputted with the color picture input device 2009, and it can constitute from a well-known image input means to store in RAM2006 or a disk unit 2002. Said color picture input means 1001 may be a well-known image input means to read an image with a color scanner, a well-known image input means to receive a color picture from a channel, and a well-known image input means to read the color picture stored in image storage equipment, and may consist of two or more above-mentioned picture input devices.
[0031] The contraction image creation means 1002 creates a contraction image from the input color picture stored input image storage means 1005 with the color picture input means 1001, and stores it in the contraction image storage means 1006.
[0032] The contraction image image area extract means 1003 extracts an image area from the contraction image which created with the contraction image creation means 1002, and was stored in the contraction image storage means 1006, and stores the data (it is hereafter called image area data) of an image area in the image area data storage means 1007.
[0033] The contraction image image area extract means 1003 extracts the input image image area extract means 1004, and from the image area data of the contraction image stored in the image area data storage means 1007, it extracts the image area in an input image, and stores it in the image area data storage means 1007.
[0034] Here, the contraction image creation means 1002, the contraction image image area extract means 1003, and the input image image area extract means 1004 can consist of RAM2004 or the disk units 2002 which are used as CPU2001 which operates by the program on ROM2004 or RAM2006, and work-piece memory in drawing 3 . It has, and CPU of ** N and respectively dedication, RAM, and a disk unit may constitute, or the hardware of dedication may constitute.
[0035] The input image storage means 1005 stores the color picture gained with the color picture input means 1001.
[0036] The contraction image storage means 1006 stores the contraction image created with the contraction image creation means 1002.
[0037] The image area data storage means 1007 stores the image area data extracted with the contraction image image area extract means 1003 and the input image image area extract means 1004.
[0038] Here, the input image storage means 1005, the contraction image storage means 1006, and the image area data storage means 1007 can consist of RAM2006 or a disk unit 2002 in drawing 3 . Of course, each means may consist of storage of dedication.
[0039] Hereafter, each process of drawing 1 is explained to a detail, using the configuration of drawing 2 .
[0040] The <color picture acquisition process> color picture input process 1 gains the digital color picture which processes using the color picture input means 1001, and stores it in the input image storage means 1005.
[0041] The <contraction image creation process> contraction image creation process 2 creates the contraction image of the input color picture stored in the input image storage means 1005 according to the color picture input process 1, and stores it in the contraction image storage means 1006. Here, a contraction image uses an input image as the image

which reduced size in every direction to 1 for N (N calls 1 for N reduction percentage an arbitration integer and the following). It can reduce to the magnitude which does not affect it as a result even if it reduces, and a contraction image is suitably specified according to the magnitude and the contents of the input image.

[0042] The contraction image creation process 2 is realizable by the well-known infanticide image creation approach, for example. For example, if the example which creates the contraction image of every direction 1/2 by the well-known infanticide image creation approach explains, the contraction image of every direction 1/2 can be created by [to which it divides into the block 3001 of 2 pixels of every direction which shows an input image to drawing 4 (a total of 4 pixels), and a contraction image corresponds 1 pixel (for example, upper left pixel 3002) of each block] setting 1 pixel to 3003. Although the example which creates the contraction image of every direction 1/2 was explained here, a block can be acquired for the contraction image of 1 for an integer of arbitration in every direction, such as 3 pixels (a total of 9 pixels) of every direction, 4 pixels (a total of 16 pixels) of every direction, and 5 pixels (a total of 25 pixels) of every direction etc., then.

[0043] Moreover, the average for every RGB value of all the pixels within a block is not cared about as a pixel value of a contraction image.

[0044] From the contraction image stored in the contraction image storage means 1005 according to the contraction image creation process 2, the <contraction image image area extract process> contraction image image area extract process 3 extracts an image area, and stores the data (it is hereafter called image area data) of the extracted image area in the image area data storage means 1007. Here, the contraction image image area extract process 3 is [Japanese Patent Application No. / No. 329111 / six to] realizable at the image area extract process of a publication. Below, the image area extract process of a publication is described [Japanese Patent Application No. / No. 329111 / six to] briefly.

[0045] [Image area data] Here, before giving detailed explanation about an image area extract process, the image area data stored in the image area data storage means 1007 are described.

[0046] The outline of image area data is shown in drawing 5 . Image area data express the image area group of an input image by the tree structure which makes each image area a node. The parentage of the tree structure expresses the inclusion relation of an image area, and the node which shows a middle image area has a child node showing one background image area in a middle image area, some middle image areas, or a general image area.

[0047] Furthermore, the data which express each node, i.e., each image area, to drawing 5 are shown. Each image area data consists of an image area class, an image area location, an image area configuration, the image area component, an image area color, a parent node, and a child node. The image area class shows any of a background image area, general image area, and middle image area the classes of this image area are. The image area location shows the coordinate location of the circumscription rectangle surrounding an image area, and is expressing it in the upper left x-coordinate of a circumscription rectangle, an upper left y-coordinate, width of face, and height. An image area configuration expresses the configuration of an image area by the binary image, and the black pixel (a pixel value is 1) shows the image area. The magnitude of a binary image and the location on an input image are equivalent to the rectangle location shown in the image area location. The image area component shows which it is among a part for the component of the image area which this image area mentioned above, i.e., color continuation preparation, a limited color alphabetic character line drawing component, etc. (be [this image area / which] did it judge?). An image area color is used when an image area component is a limited color or a limited value component (a limited color alphabetic character line drawing, limited color false halftone, a limited value alphabetic character line drawing, limited value false halftone), and it stores the average RGB value of an image area. A parent node is a pointer in which a parent node is shown, and are two or more pointers in which a child node is shown. In addition, although a parent node is surely set to one, a child node is not necessarily one. Therefore, when there are two or more child nodes, the pointer for the number will be added.

[0048] An image area extract process repeats recursively the image area separation process of dividing further the middle image area in an image (an input image also being included in a middle image area) to a background image area and a middle image area, and extracts an image area until it judges that the non-divided image area was lost, as mentioned above.

[0049] An image area separation process considers a middle image area (an input image is also included in a middle image area) as an input, and judges whether an input middle image area can separate into a background image area and some middle image areas further. When it is judged that it is separable, an input middle image area is divided into a background image area and some middle image areas.

[0050] For example, the image area 7003 in drawing 17 is made into an input middle image area, and when it is judged that the input middle image area 7003 is further inseparable into a middle image area, let the input middle image area

7003 be a termination image area. Moreover, the image area 7004 in drawing 17 is made into an input middle image area, and when it is judged that the input middle image area 7004 is further separable into a middle image area, the input middle image area 7004 is divided into the background image area 7005 and the middle image area 7006.
[0051] Next, the detailed configuration of an image area separation process is explained using drawing 6 .
[0052] It judges whether the background image area separation process 31 has a background image area in an input middle image area, and when it judges with there being a background image area, a background image area is separated. For example, it judges whether a background image area is in an input image area by computing how many colors (it is called a background color a color with most pixel numbers, and the following all over an image area) of a background occupy, and let a pixel with the color near a background color be a background image area.
[0053] The middle image area separation process 32 divides into some middle image areas image areas other than the image area which the background image area separation process 31 separated as a background image area using geometric relation. the specifically connected pixel group -- or (using expansion/contraction processing etc.) let a near connected component geometrically be one middle image area.
[0054] The image area registration process 33 stores in the image area data storage means 1007 the image area separated at the background image area separation process 31 and the middle image area separation process 32.
[0055] In addition, since a contraction image image area extract process has the small size of the image to process rather than it applies said image area extract process to a direct-input image, an image area can be extracted at a high speed. Furthermore, on a contraction image, the processing time becomes short by what is necessary being just to look for the narrow range (for it to specifically compare with extracting on an input image, and to be the range where only reduction percentage is narrow) etc. (the count of a repeat of expansion/contraction processing specifically becoming fewer) rather than it carries out on an input image, although a near connected component is geometrically extracted at the middle image area separation process 32.
[0056] Returning to <input image image area extract process> drawing 1 , the contraction image image area extract process 3 extracts the input image image area extract process 4, and it creates the image area data in an input image from the image area data of the contraction image stored in the image area data storage means 1007.
[0057] A part of example of a configuration of the input image image area creation process 4 is shown in drawing 7 . Moreover, the image of the input image image area creation process 4 is shown in drawing 8 . At the input image image area creation process 4, the process shown in drawing 7 is performed to all the image areas stored in image area data.
[0058] In drawing 7 , the image area location conversion process 41 computes the image area location (4002 in drawing 8) in an input image from the image area location (sign 4001 in drawing 8) in the contraction image of image area data, and stores it in image area data. Specifically, the inverse number of reduction percentage is applied to the value of the X coordinate which shows an image area location, Y coordinate, width of face, and height.
[0059] The input image image area configuration extract process 42 extracts the image area configuration of an input image in the rectangle image area of the image area location computed at the image area location conversion process 41 in an input image. The rectangle image area of the image area location (4002 in drawing 8) computed at the image area location conversion process 41 in an input image is specifically made binary to image areas other than a background color and a background color, the binary image (sign 4003 in drawing 8) in which the image area configuration in an input image is shown is extracted, and it stores in the image area configuration of image area data. Here, the value (it has stored as an image area color of the image area data of a background image area) computed at the background image area separation process 31 of the contraction image image area extract process 3 is used for a background color. Thereby, without computing a background color again, to the image area which the input image limited, simple binary-ized processing is only performed and it can process at a high speed.
[0060] In the above, the example of this invention was described. Here, the image area data extracted at the input image image area extract process are available to the variable power / amount-of-data reduction / document structuring of a color picture by the approach of a Japanese Patent Application No. [No. 32911 / six to] publication.
[0061] Hereafter, the approach of a publication is explained [Japanese Patent Application No. / No. 32911 / six to] briefly. The example of a configuration of the color picture variable power approach is shown in drawing 9 .
[0062] The image area judging process 5 judges the image area components (a part for color continuation preparation etc.) of each image area extracted according to the input image image area extract process 4. The accommodative variable power process 6 performs variable power processing according to the image area component judged at the image area judging process 5 to each image area extracted according to the input image image area extract process 4, and creates the variable power image of an input image. The color picture output process 7 performs the output to the display of the variable power image created according to the accommodative variable power process 6, hard copy, or a channel.

[0063] Next, the example of a configuration of the color picture compression approach is shown in drawing 10 R> 0.
[0064] The image area judging process 5 judges the class of each image area extracted according to the input image image area extract process 4, and stores it in the data of an image area. The accommodative pressing operation 8 performs compression processing according to the class of image area judged at the image area judging process 5 to each image extracted according to the input image image area extract process 4, and creates the compressed data of an input image. The compressed data output process 9 outputs the compressed data created by the accommodative pressing operation 8 by transmission to a channel, the writing to image storage equipment, etc. The compressed data input process 10 inputs the data compressed by the accommodative pressing operation 8 by the reception from a channel, reading from image storage equipment, etc. The color picture playback process 11 reproduces the data compressed by the accommodative pressing operation 8 to a color picture. The color picture output process 7 performs a display, hard copy, etc. of a playback image which were created according to the color picture playback process 11. Here, the process from the color picture input process 1 to the compressed data output process 9 is performed at the time of compression of a color picture, and the process from the compressed data input process 10 to the color picture output process 7 is performed at the time of playback of compressed data.
[0065] The example of a configuration of the approach (document image structuring) of inputting into DTP equipment at drawing 11 as data which structured the color copy is shown.
[0066] The image area judging process 5 judges the class of each image area extracted according to the input image image area extract process 4, and stores it in the data of an image area. The data-conversion process 12 changes the image area data created at the process to the image area judging process 5 into the data format as image data of document image edit equipments, such as DTP equipment, for every image area. The document image edit process 13 performs edit and the output of a document image by the well-known document image edit image edit approach of editing a document image according to directions of a user.
[0067] In the 1st example of the <explanation of 2nd example> above, the input image image area extract process 4 was what makes binary the part equivalent to the image area location of each image area extracted by the contraction image in an input image, and computes the image area configuration in an input image. Although a result that this approach is comparatively easy to calculate and good is obtained, when the circumscription rectangle surrounding the image area extracted as shown in drawing 13 has lapped, there is a trouble of also extracting the configuration of other image areas in an overlapping part. Thus, in considering the image with which the circumscription rectangle surrounding an image area has lapped as an input, it realizes input image image area extract process 4' with the following configurations. Although the contents of processing become complicated somewhat, the above-mentioned trouble is solvable.
[0068] A part of example of a configuration of input image image area extract process 4' is shown in drawing 12 . Moreover, the image Fig. of the input image image area creation process in the 2nd example is shown in drawing 13 . In input image image area extract process 4', the process shown in drawing is performed to all the image areas stored in image area data.
[0069] In drawing 12 , like the 1st example, the image area location conversion process 41 computes the image area location (sign 5002 in drawing 13) in an input image from the image area location (sign 5001 in drawing 13) in the contraction image of image area data, and stores it in image area data.
[0070] At the contraction image image area configuration expansion process 43, well-known expansion processing is performed to the binary image (sign 5003 in drawing 13) in which the image area configuration in the contraction image extracted at the contraction image image area extract process 41 is shown (the sign 5004 in drawing 13 and the image which expanded below are called an expansion image). Only the inverse number time of reduction percentage performs expansion processing.
[0071] Like the input image image area configuration extract process 42 of the 1st example, although the alternative input image image area configuration extract process 44 extracts the image area configuration in an input image, refer to the expansion image created at the contraction image image area expansion process 43 for it so that the lap of a region circumscription rectangle may not extract to other image areas. As opposed to each pixel of the rectangle image area of the image area location (sign 5002 in drawing 13) specifically computed at the image area location conversion process 41 in an input image Only the pixel which is a pixel with values other than a background color (sign 5005 in drawing 13), and is the image area (a pixel value is 1) where the pixel which corresponds in the expansion image (sign 5004 in drawing 13) created at the contraction image image area expansion process 43 corresponds Suppose that it is an image area (a pixel value is 1) (5006 in drawing 13). Thus, the created binary image is stored in the image area configuration of image area data.
[0072] Of course, a background color uses the value (it has stored as an image area color of the image area data of a

background image area) computed at the background image area separation process 31 of the contraction image image area extract process 3 like the 1st example.

[0073] In addition, the above-mentioned contraction image image area configuration expansion process 43 is realizable even if there is nothing. When there is no contraction image image area configuration expansion process 43, although an extract result is inferior, it is effective in a process becoming simple.

[0074] A good result is obtained also when the circumscription rectangle surrounding an image area has lapped according to the example of this input image image area extract process 4, although the configuration of processing becomes complicated compared with the 1st example.

[0075] In input image image area extract process 4' in the 2nd example of <explanation of the 3rd example>, it was the approach of extracting an input image image area combining the binary-ized result in the image area configuration in a contraction image, and an input image. A good result is obtained also when the circumscription rectangle to which this approach surrounds an image area has lapped. However, when a color picture is received and a contraction image is created, a part of image area may be thinned out, a chip may arise in the image area configuration of a contraction image, and a chip may arise also in the image area configuration in a final input image. Thus, when creating a contraction image and thinning out a part of image area, it can cope with that input image image area extract process 4" is also by the following configurations. That is, although a process becomes complicated somewhat, the above-mentioned trouble is solvable.

[0076] A part of example of a configuration of input image image area extract process 4" in the 3rd example is shown in drawing 14 . Moreover, the image Fig. of input image image area extract process 4" in the 3rd example is shown in drawing 15 . In input image image area extract process 4", it carries out to the assembly (it is called the same level image area group) of an image area with the same background image area which shows the process shown in drawing 14 to drawing 16 , and carries out to all the image areas stored in image area data.

[0077] In drawing 14 , to each image area of the same level image area group, the image area location conversion process 41 computes the image area location (sign 6002 in drawing 15 R> 5) in an input image from the image area location (sign 6001 in drawing 15) in the contraction image of image area data, and stores it in image area data like the 1st example.

[0078] The image area location of the same level image area group computed at the image area location conversion process 41 in an input image in the input image image area configuration extract process 42 (namely, the image area location of a background image area) The rectangle image area equivalent to the sign 6003 in drawing 15 is made binary to image areas other than a background color and a background color like the input image image area configuration extract process 42 of the 1st example, and the image area configuration of the same whole level image area group in an input image is created (sign 6004 in drawing 15). Of course, a background color uses the value (it has stored as an image area color of the image area data of a background image area) computed at the background image area separation process 31 of the contraction image image area extract process 3 like the 1st example.

[0079] At the chip image area extract process 45, the field (it is hereafter called a chip image area) which lacked in the creation time of a contraction image is extracted by comparing the image area extracted from the contraction image with the image area extracted from the input image. For this reason, the number (label) of a proper is assumed to each image area to each pixel of the binary image (sign 6004 in drawing 15) showing the image area configuration created at the input image image area configuration extract process 42 to the pixel corresponding to either of the image areas of the same level image area group. Next, the label of the pixel on the binary image showing the image area configuration created in the image area configuration of each image area at the input image image area configuration extract process 42 corresponding to the pixel which is an image area (a pixel value is 1) is written in (sign 6005 in drawing 15 R> 5). It is missing and what is the image area created at the input image image area configuration extract process 42, and finally is not carrying out label attachment is extracted as an image area (6006 in the image area which lacked in contraction image creation time, and drawing 15).

[0080] At a chip image area integrated process, it is missing and 46 unifies an image area to the image area [finishing / an extract / already] extracted at the chip image area extract process 45. The label of the pixel which is specifically most in near to the pixel to which label attachment was not performed at the chip image area extract process 45 and which has carried out label attachment is attached, and it unifies to an image area [finishing / an extract / already] (sign 6007 in drawing 15). Finally, it asks for the circumscription rectangle (sign 6008 in drawing 15) of each label, and to the image area data of each image area, while changing an image area location, the configuration (binary image) of a label is stored in an image area configuration.

[0081] A good result is obtained, also when creating a contraction image and a part of image area has been thinned out according to the example of this input image image area extract process 4, although it becomes complicated [the

configuration of processing] compared with the 1st example and 2nd example.
[0082] As explained above, according to the 1-10th and the 14-23rd invention concerning this application, it is not based on the magnitude of an input image, but it is possible to offer the image-processing approach and equipment which perform image area separation of a color document image equivalent to the result which carried out true image region separation to the input image at high speed. Moreover, according to the 11th and 24th invention concerning this application, it is not based on the magnitude of an input image, but it is possible to offer the image-processing approach and equipment which perform image area separation of the same color document image as the result which carried out true image region separation to the input image, and perform variable power of a color document image by good image quality at high speed.
[0083] Moreover, according to the 12th and 25th invention concerning this application, it is not based on the magnitude of an input image, but it is possible to offer the image-processing approach and equipment which perform image area separation of a color document image equivalent to the result which carried out true image region separation to the input image, and perform compression/elongation (playback) with good image quality and good compressibility at high speed.
[0084] Moreover, according to the 13th and 26th invention concerning this application, it is not based on the magnitude of an input image, but it is possible to offer the image-processing approach and equipment which can be edited as data which performed image area separation of a color document image equivalent to the result which carried out true image region separation to the input image, and structured the color document image at high speed.
[0085] In addition, even if it applies this invention to the system which consists of two or more devices, it may be applied to the equipment which consists of one device. Moreover, it cannot be overemphasized that this invention can be applied also when attained by supplying a program to a system or equipment.
[0086]
[Effect of the Invention] As explained above, according to this invention, it is not based on the magnitude of an input image, but it becomes possible to perform image area separation of a color document image equivalent to the result which carried out true image region separation to the input image at high speed.
[0087] Moreover, it is not based on the magnitude of an input image, but at high speed, image area separation of the same color document image as the result which carried out true image region separation to the input image is performed, and it becomes possible to perform variable power of a color document image by good image quality.
[0088] Moreover, it is not based on the magnitude of an input image, but at high speed, image area separation of a color document image equivalent to the result which carried out true image region separation to the input image is performed, and it becomes possible to perform compression/elongation (playback) with good image quality and good compressibility.
[0089] Furthermore, it is not based on the magnitude of an input image, but at high speed, image area separation of a color document image equivalent to the result which carried out true image region separation to the input image is performed, and it can edit now again as data which structured the color document image.
[0090]

[Translation done.]

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the configuration of the color picture art which applied this invention.
[Drawing 2] It is drawing showing the configuration of the color picture processor which applied this invention.
[Drawing 3] It is drawing showing the example of hardware implementation of the color picture processor which applied this invention.
[Drawing 4] It is drawing explaining a contraction image creation process.
[Drawing 5] It is the mimetic diagram of image area data.
[Drawing 6] It is drawing showing the configuration of an image area separation process.
[Drawing 7] It is drawing showing the configuration of an input image image area configuration extract process.
[Drawing 8] It is drawing explaining an input image image area configuration extract process.
[Drawing 9] It is drawing showing the configuration of the color picture variable power approach which applied this invention.
[Drawing 10] It is drawing showing the configuration of the color picture compression approach which applied this invention.
[Drawing 11] It is drawing showing the configuration of the document image edit approach which applied this invention.
[Drawing 12] It is drawing showing the configuration of an input image image area configuration extract process.
[Drawing 13] It is drawing explaining an input image image area configuration process.
[Drawing 14] It is drawing showing the configuration of an input image image area configuration extract process.
[Drawing 15] It is drawing explaining an input image image area configuration extract process.
[Drawing 16] It is drawing explaining the same level image area group.
[Drawing 17] It is drawing explaining the outline of the image area separation approach used by this invention.
[Description of Notations]
1 Color Picture Input Process
2 Contraction Image Creation Process
3 Contraction Image Image Area Extract Process
4 Input Image Image Area Extract Process
5 Image Area Judging Process
6 Accommodative Variable Power Process
7 Color Picture Output Process
8 Accommodative Pressing Operation
9 Compressed Data Output Process
10 Compressed Data Input Process
11 Color Picture Playback Process
12 Data-Conversion Process
13 Document Image Edit Process
31 Background Image Area Separation Process
32 Middle Image Area Separation Process
33 Image Area Registration Process
41 Image Area Location Conversion Process
42 Input Image Image Area Configuration Extract Process
43 Contraction Image Image Area Configuration Expansion Process

44 Alternative Input Image Image Area Configuration Extract Process
45 Chip Image Area Extract Process
46 Chip Image Area Integrated Process
1001 Color Input Means
1002 Contraction Image Creation Means
1003 Contraction Image Image Area Extract Means
1004 Input Image Image Area Extract Means
1005 Input Image Storage Means
1006 Contraction Image Storage Means
1007 Image Area Data Storage Means

[Translation done.]

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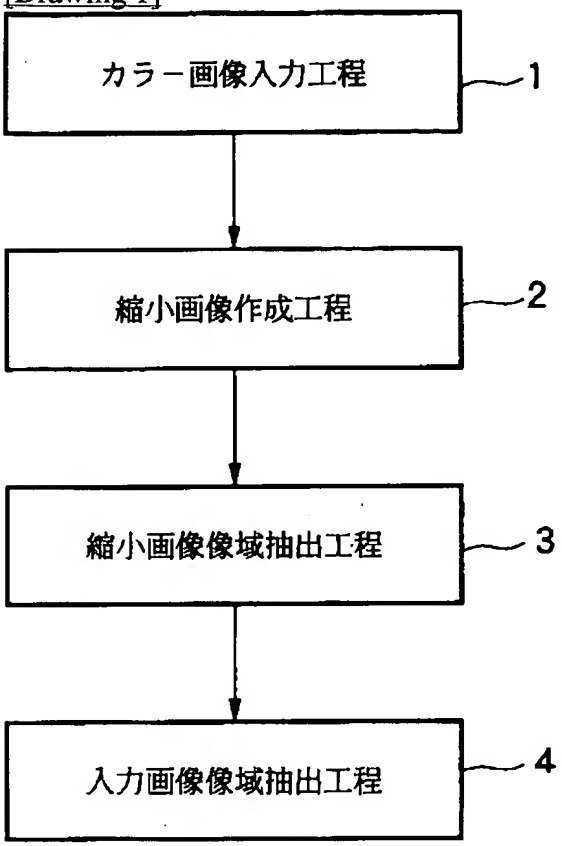
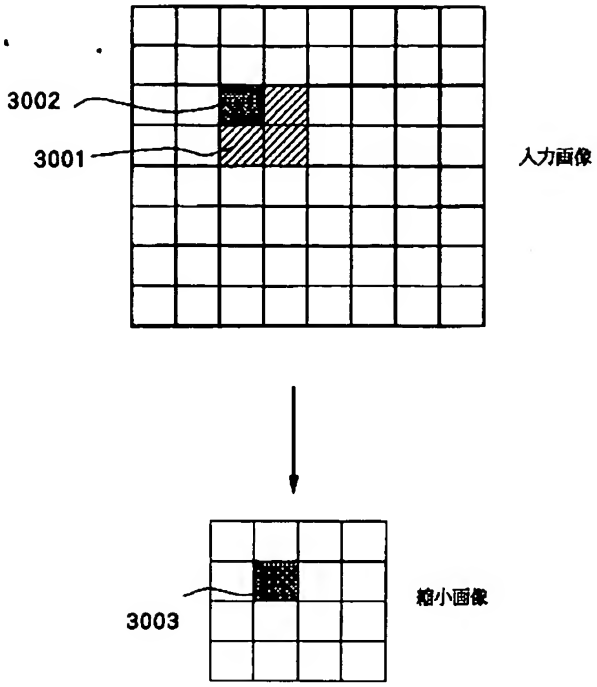
3.In the drawings, any words are not translated.

DRAWINGS

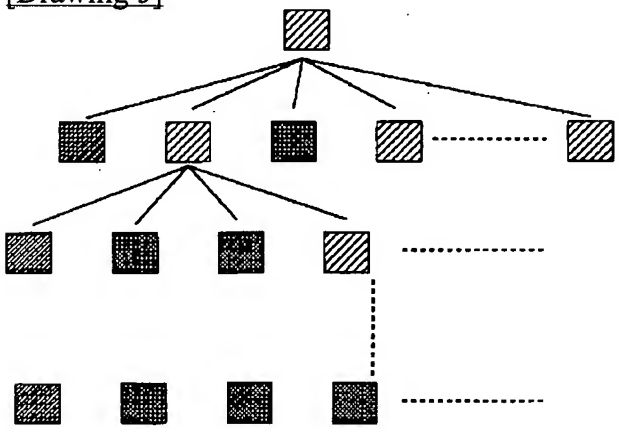
[Drawing 1]



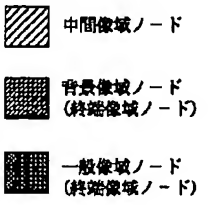
[Drawing 4]



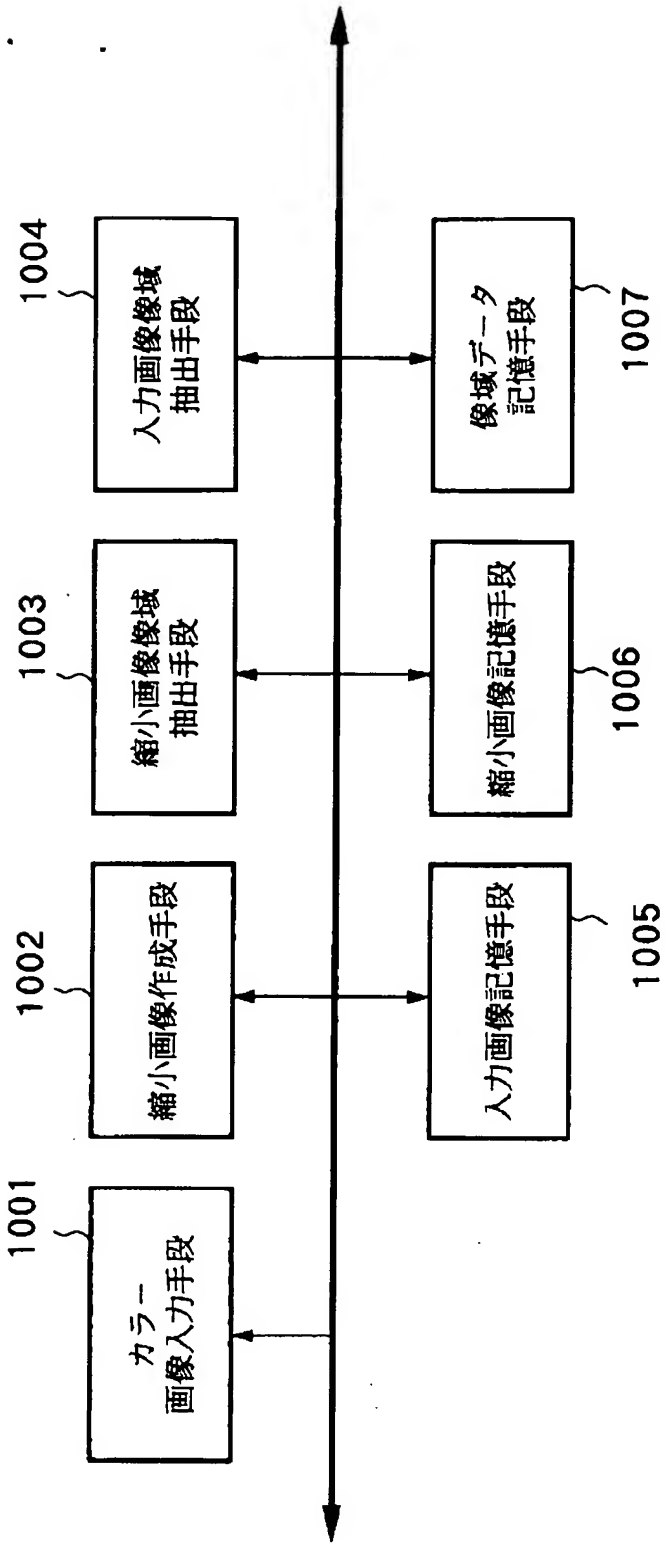
[Drawing 5]



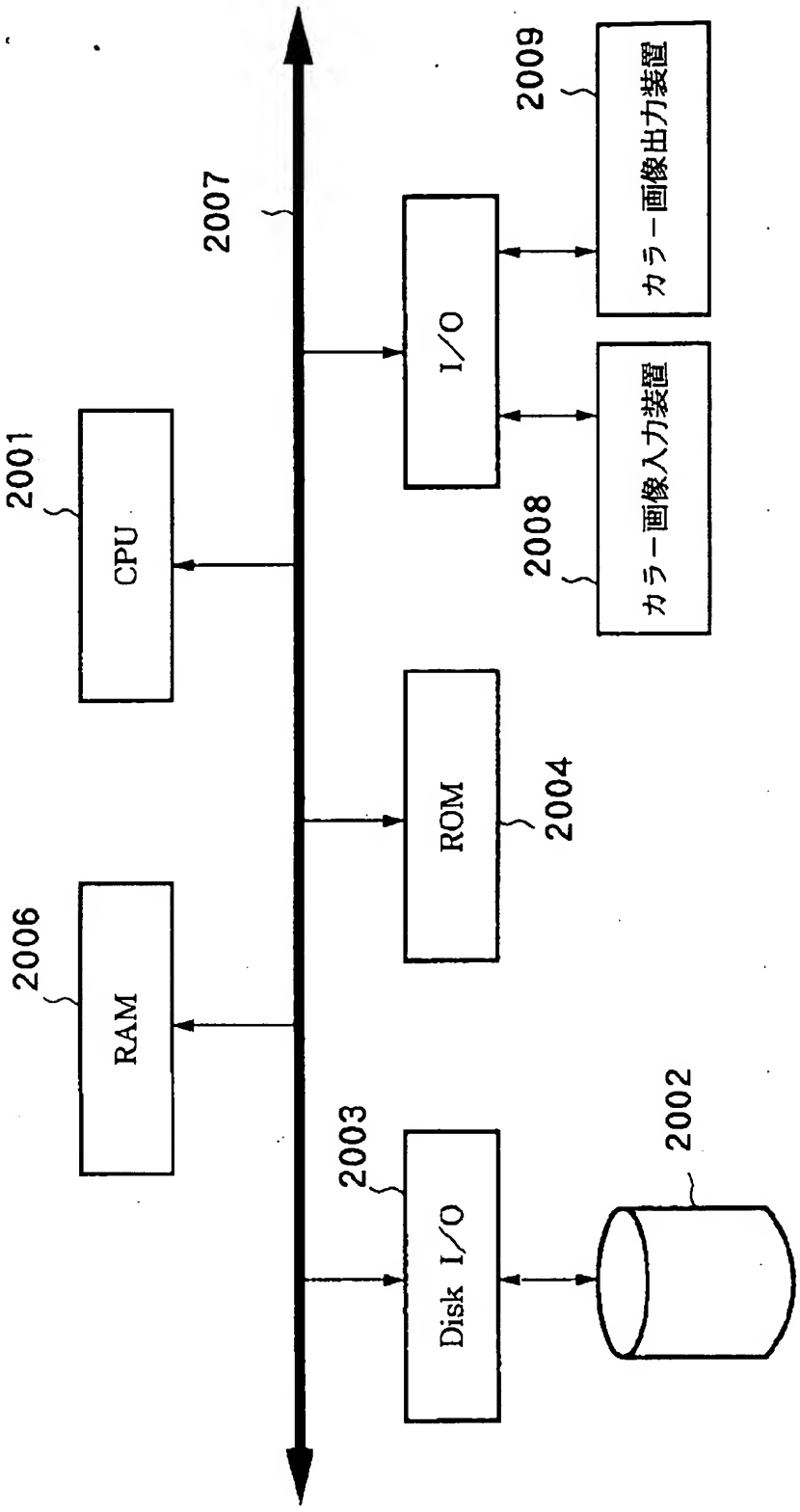
像域種類	
像域位置 x座標 y座標 幅 高さ	
像域形状	
像域成分	
像域色 R G B	
親ノード	
子ノード	



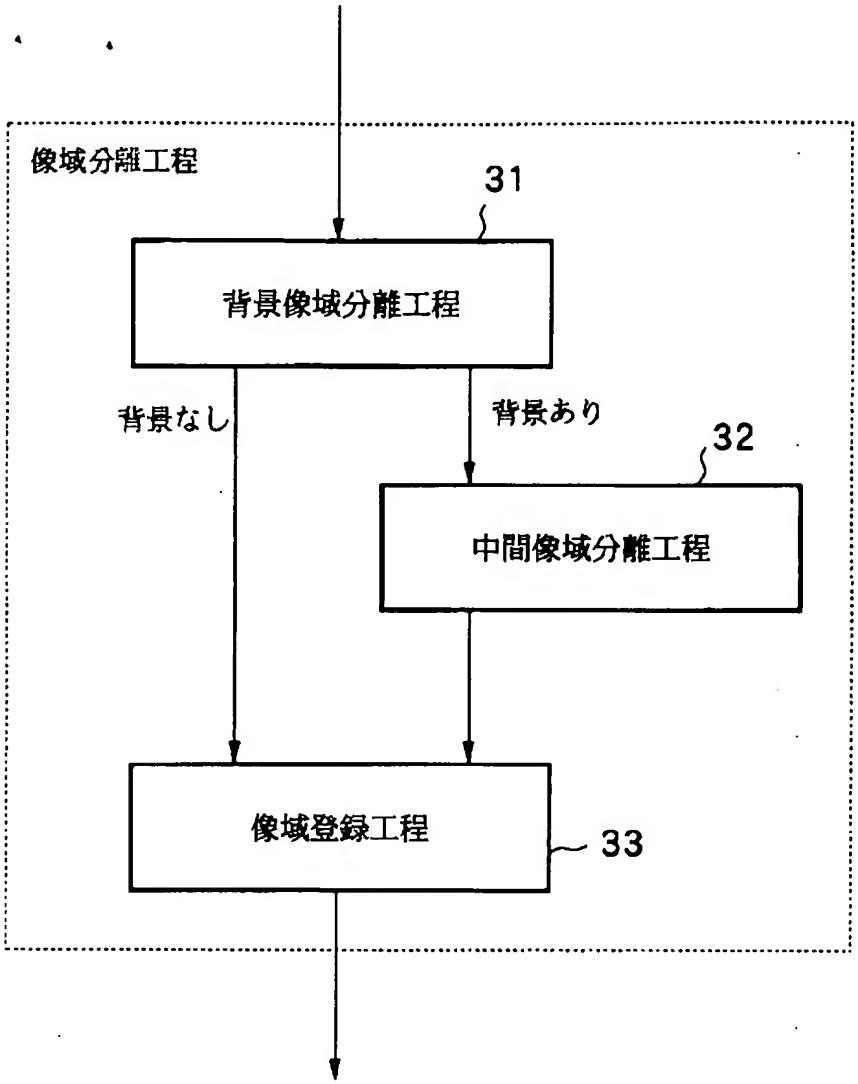
[Drawing 2]


1001
カラー
画像入力手段
1002
縮小画像作成手段
1003
縮小画像像域
抽出手段
1004
入力画像像域
抽出手段
1005
入力画像記憶手段
1006
縮小画像記憶手段
1007
像域データ
記憶手段

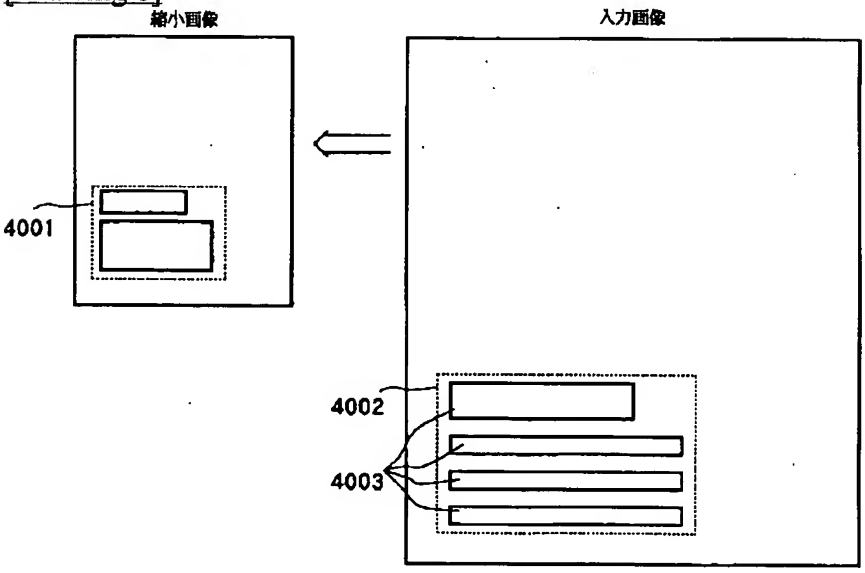
[Drawing 3]


2007
2001
CPU
2006
RAM
2004
ROM
2003
Disk I/O
2002
I/O
2009
カラー画像出力装置
2008
カラー画像入力装置

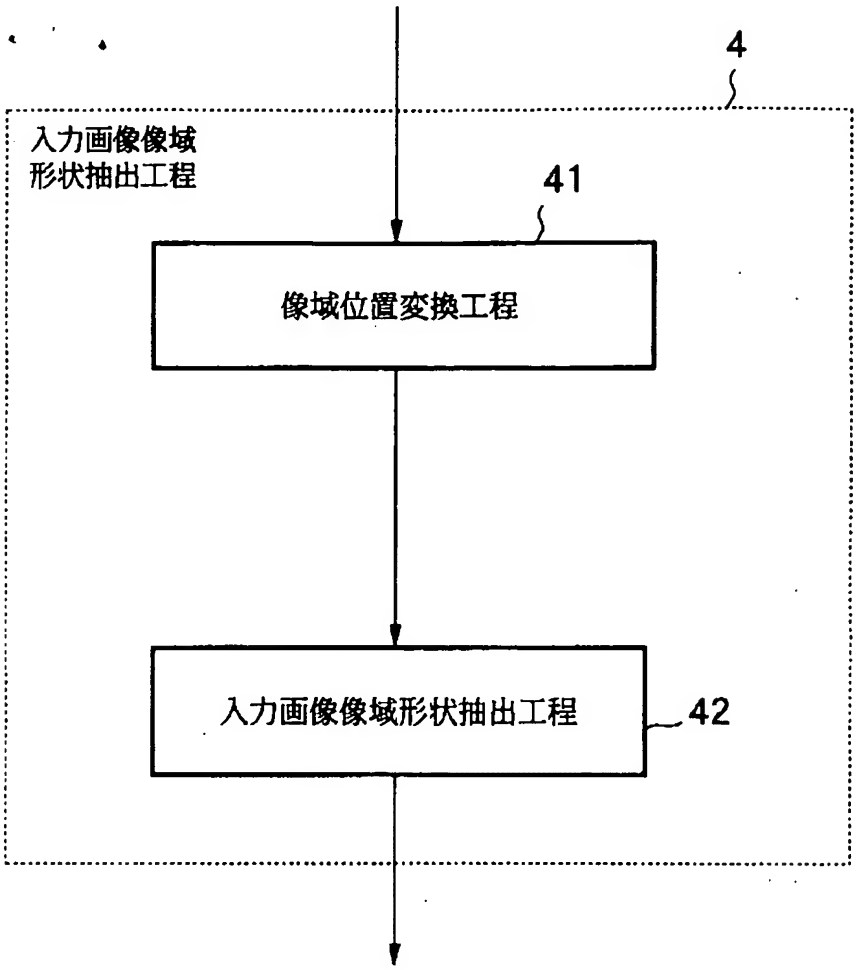
[Drawing 6]



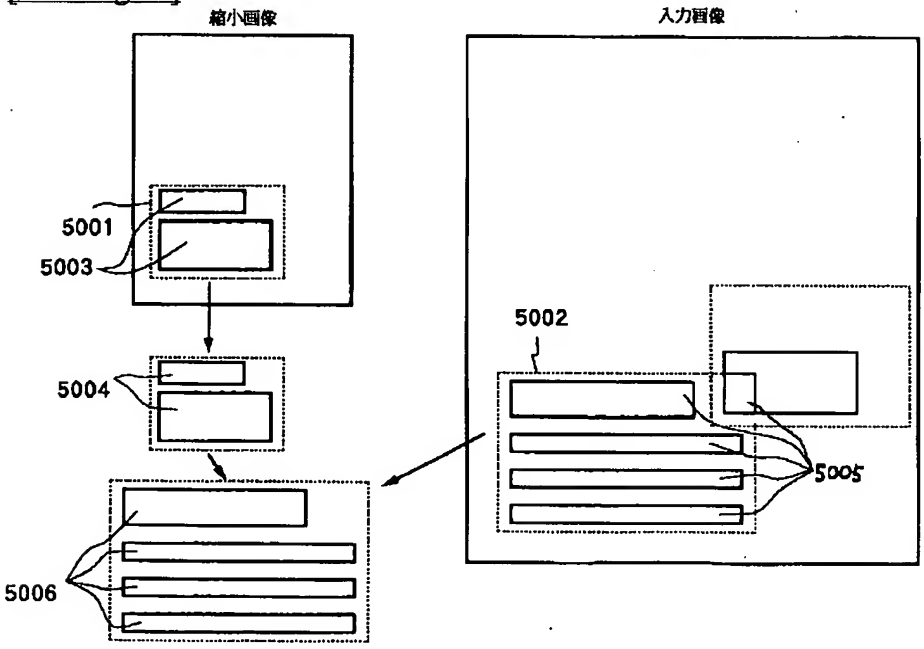
[Drawing 8]



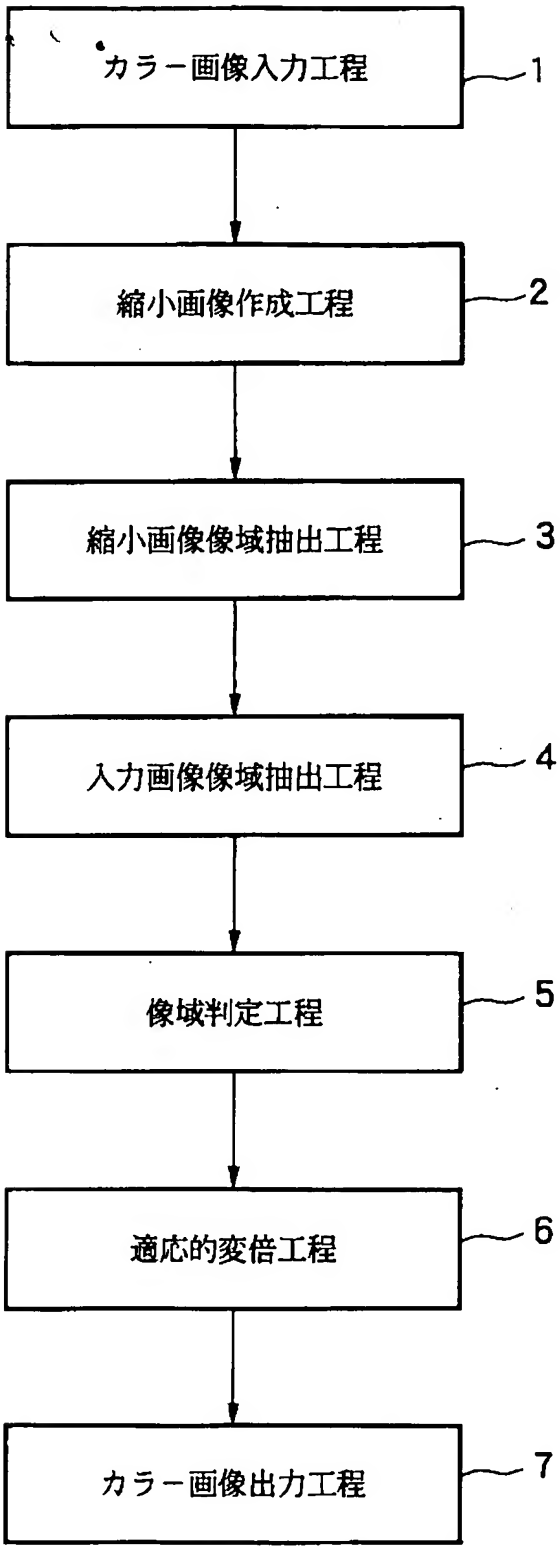
[Drawing 7]



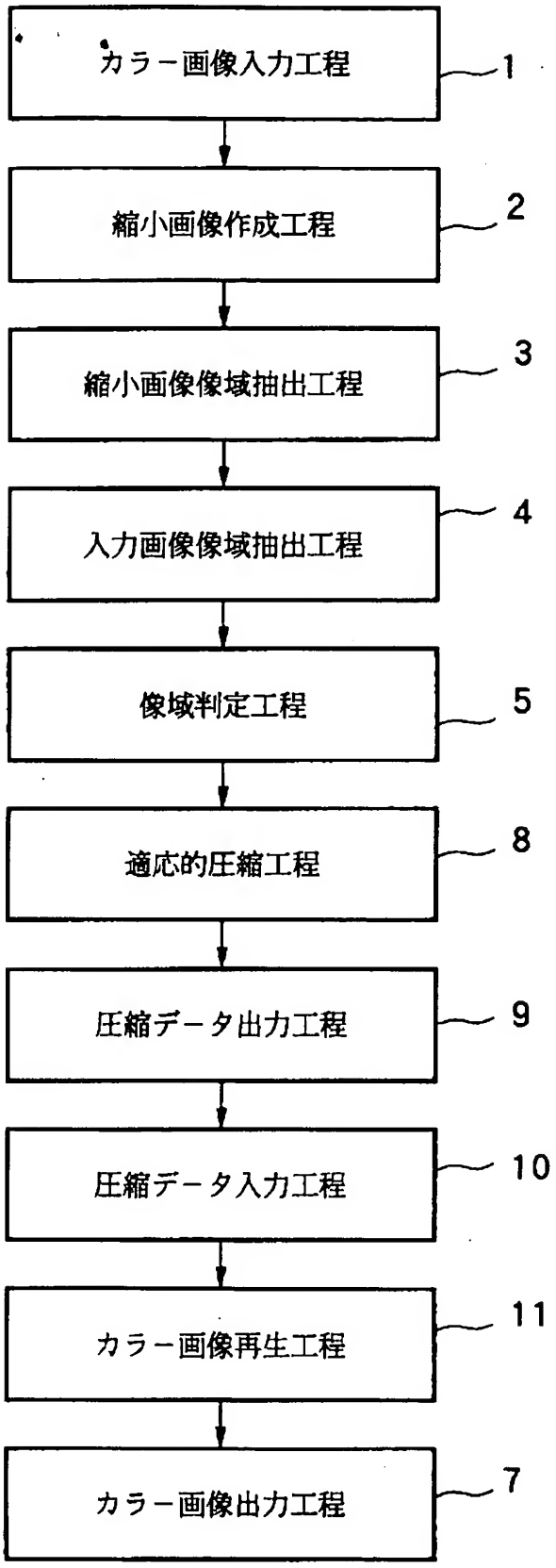
[Drawing 13]



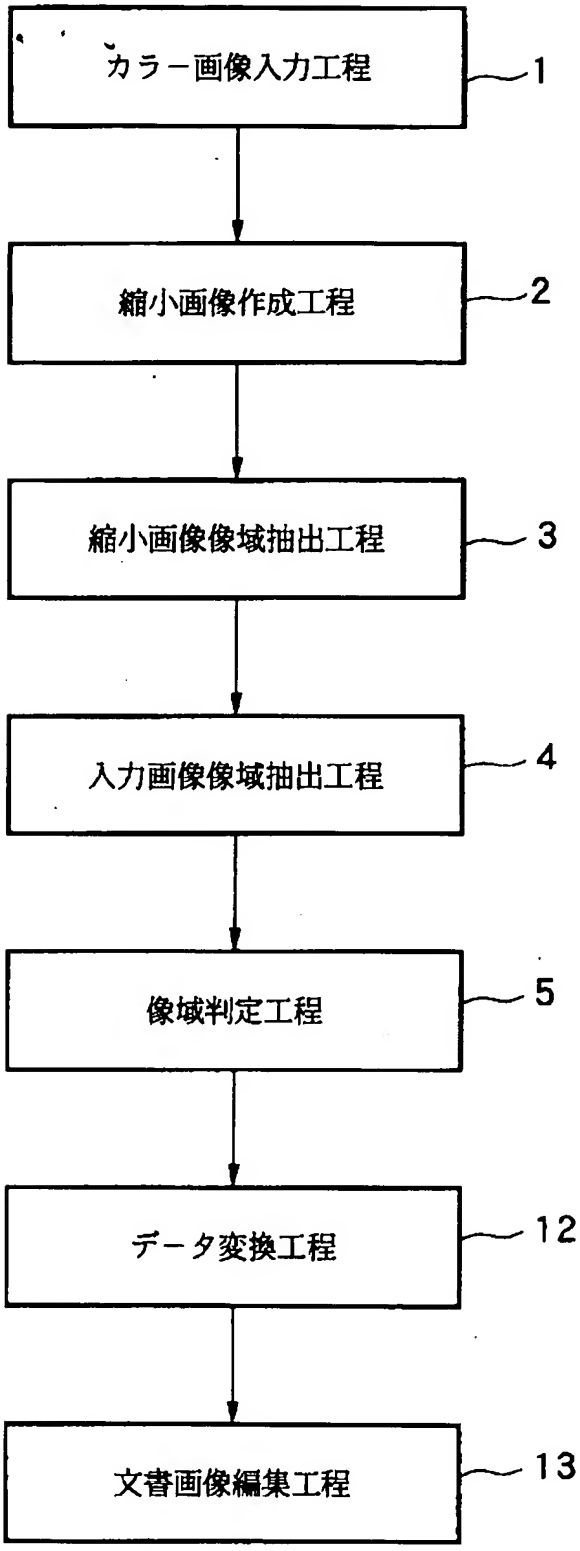
[Drawing 9]


カラー画像入力工程
1
縮小画像作成工程
2
縮小画像像域抽出工程
3
入力画像像域抽出工程
4
像域判定工程
5
適応的変倍工程
6
カラー画像出力工程
7

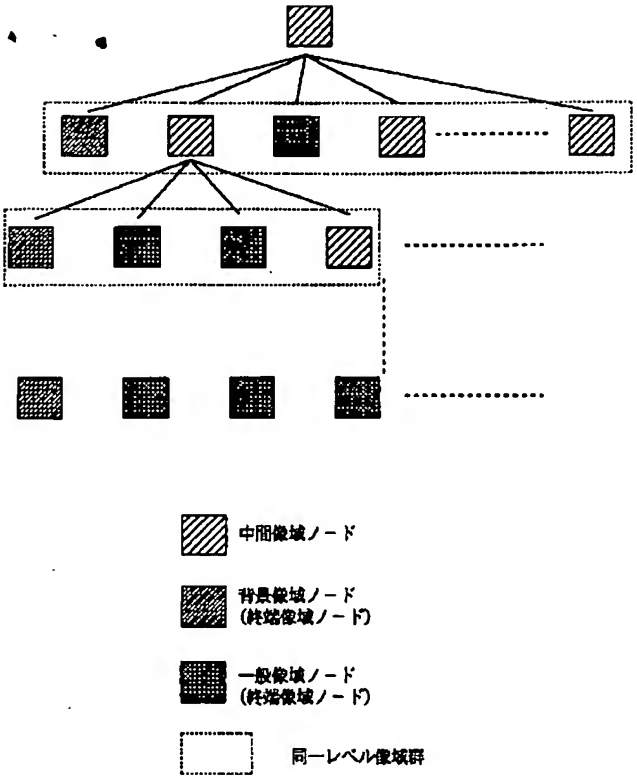
[Drawing 10]


カラー画像入力工程
1
縮小画像作成工程
2
縮小画像像域抽出工程
3
入力画像像域抽出工程
4
像域判定工程
5
適応的圧縮工程
8
圧縮データ出力工程
9
圧縮データ入力工程
10
カラー画像再生工程
11
カラー画像出力工程
7

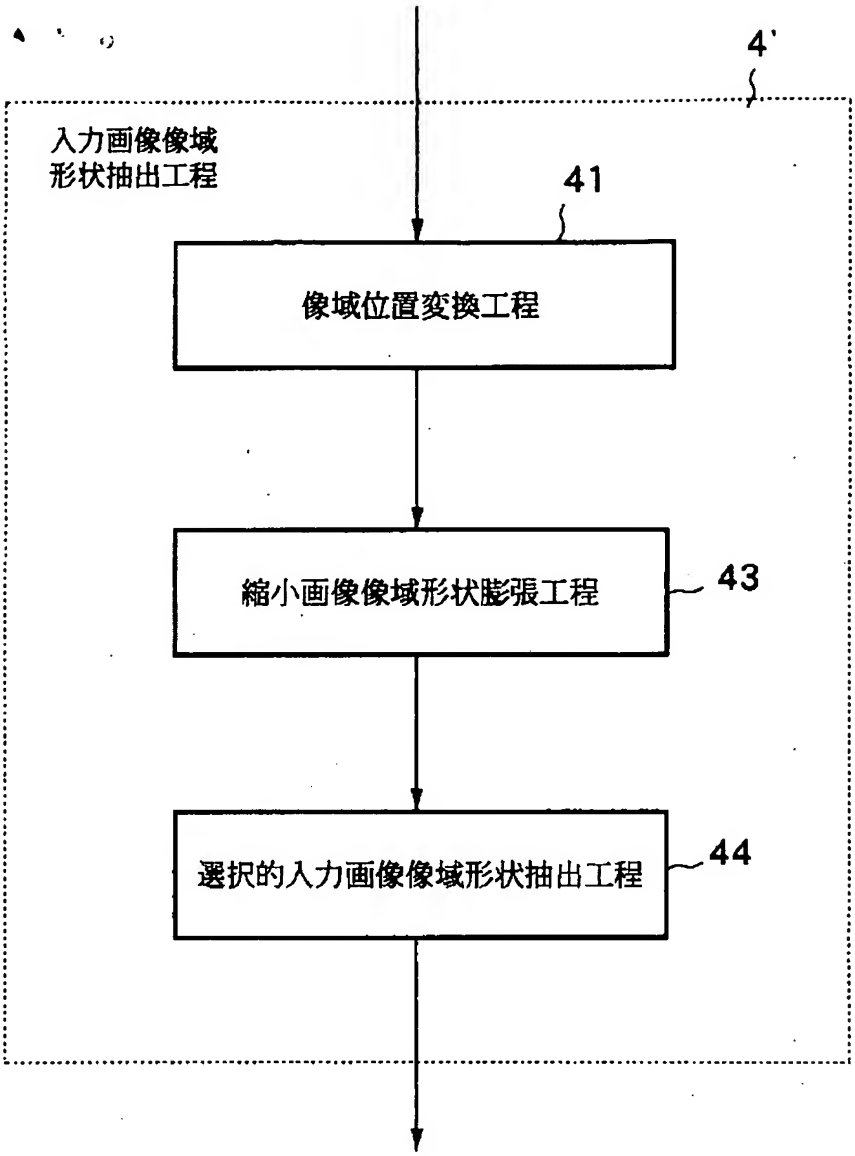
[Drawing 11]


カラー画像入力工程
1
縮小画像作成工程
2
縮小画像像域抽出工程
3
入力画像像域抽出工程
4
像域判定工程
5
データ変換工程
12
文書画像編集工程
13

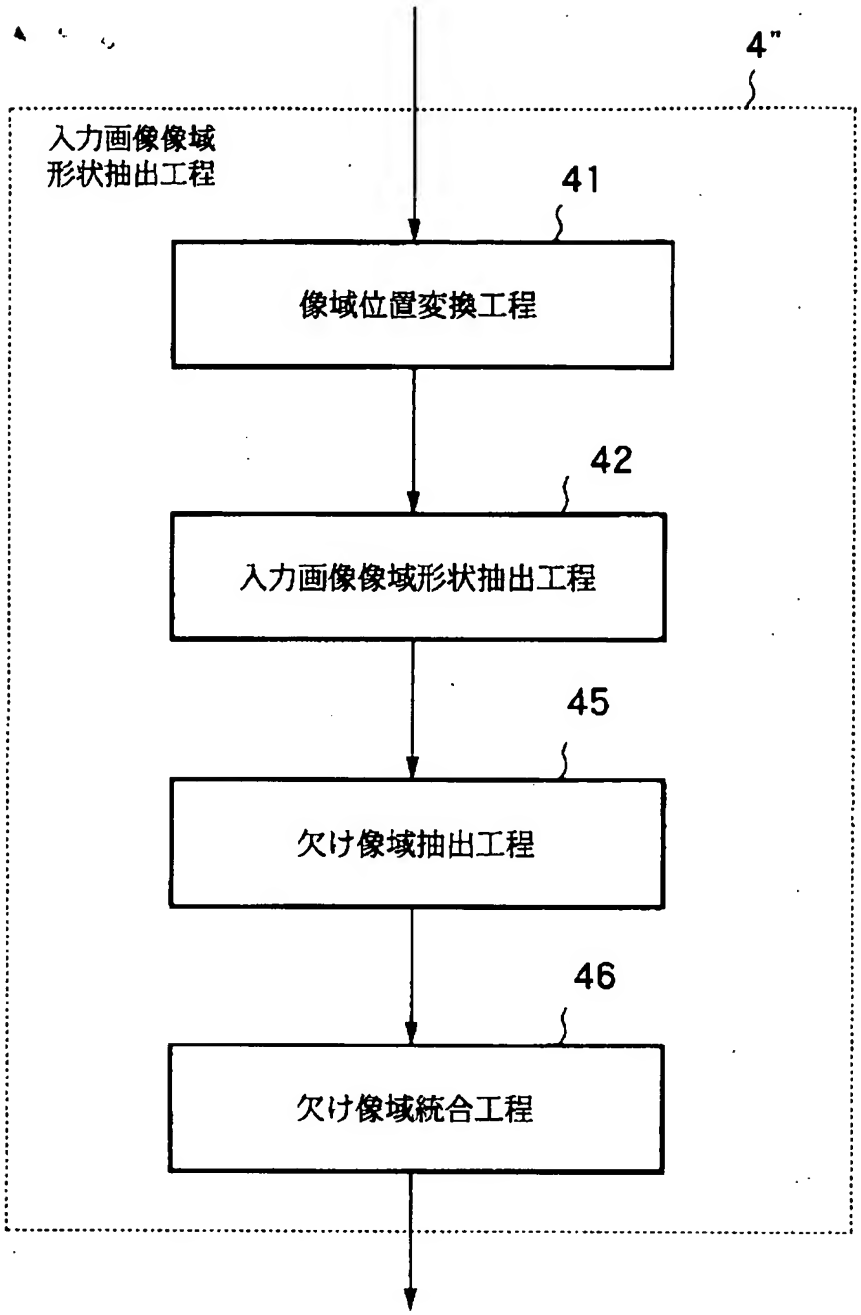
[Drawing 16]



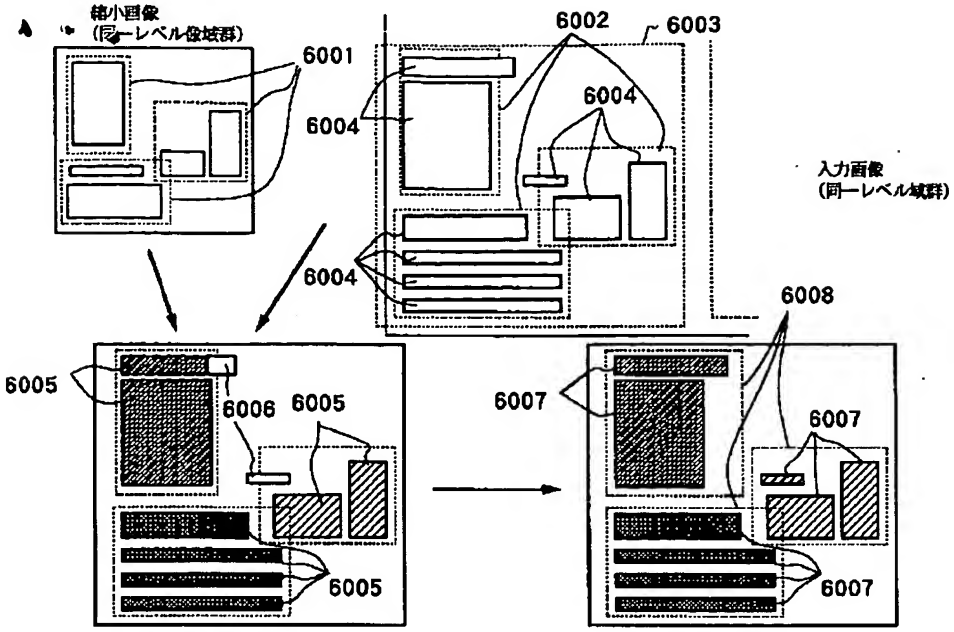
[Drawing 12]


4'
入力画像像域
形状抽出工程
41
像域位置変換工程
縮小画像像域形状膨張工程
43
選択的入力画像像域形状抽出工程
44

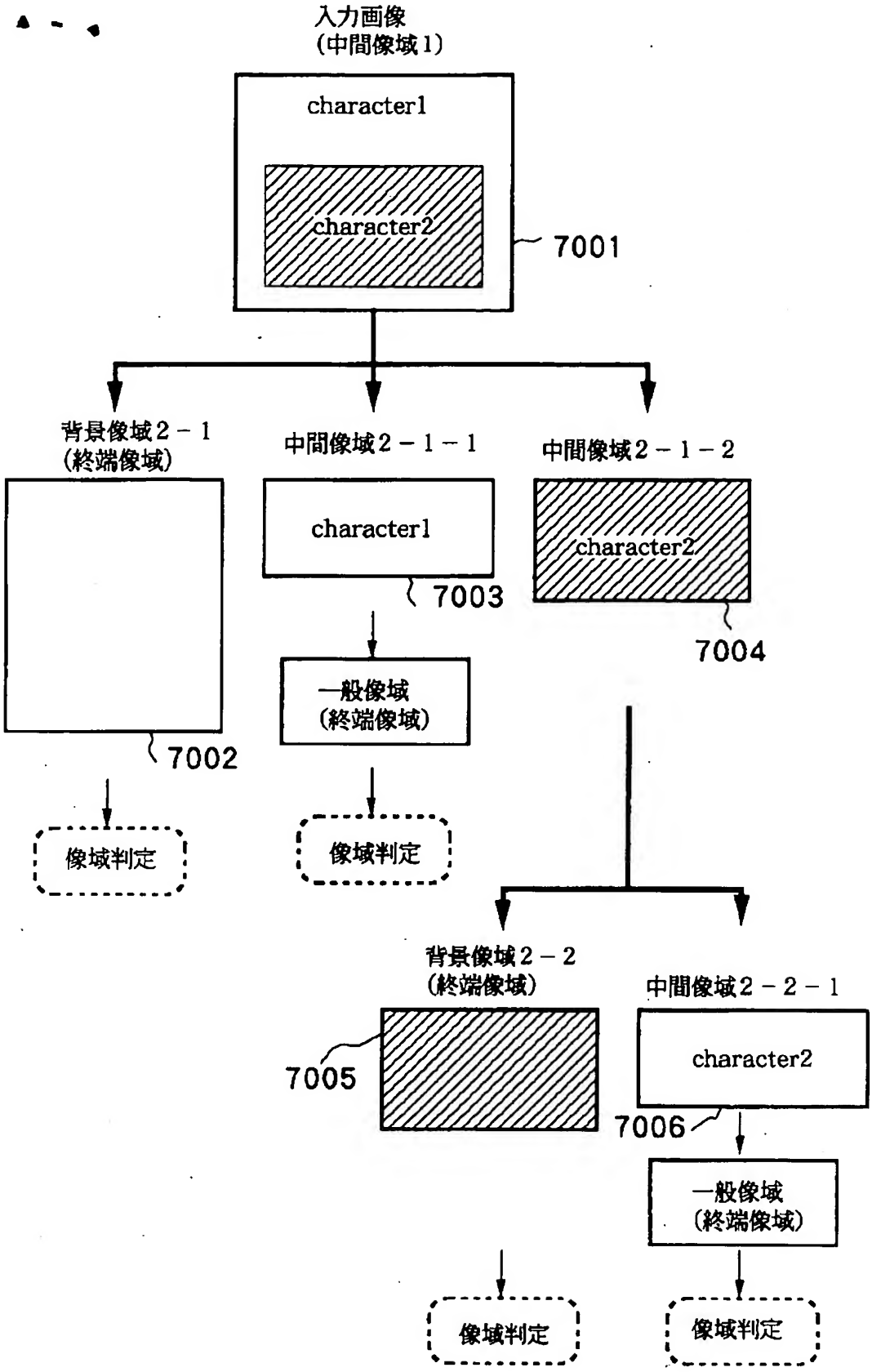
[Drawing 14]


4"
入力画像像域
形状抽出工程
41
像域位置変換工程
42
入力画像像域形状抽出工程
45
欠け像域抽出工程
46
欠け像域統合工程

[Drawing 15]


縮小画像
(同一レベル領域群)
6001
6002
6003
6004
6004
6004
入力画像
(同一レベル領域群)
6008
6005
6006
6005
6005
6007
6007
6007

[Drawing 17]



[Translation done.]